Protocols for Hospital Newborn Hearing Screening
Virginia Early Hearing Detection and Intervention Program
Virginia Department of Health

The focus of this document is to provide guidance and recommended procedures for best practice to be used by hospitals for universal newborn hearing screening programs as required by Section 32.1-64.1 of the *Code of Virginia*.

It is important to recognize that newborn hearing screening is only one component of a comprehensive approach to the management of childhood hearing loss. The process also requires follow-up diagnostic services, counseling, intervention programs, and parental educational programs. This comprehensive process must be administered by a multidisciplinary team consisting of individuals such as audiologists, physicians, educators, speech/language pathologists, nurses, and parents.

The Virginia Early Hearing Detection and Intervention (VEHDI) Program goals are to identify congenital hearing loss by three months of age and to assure enrollment in appropriate intervention services, including amplification if indicated, by six months of age.

I. Screening Requirements

Virginia law requires that all infants be given a physiological hearing screening prior to discharge from the hospital after birth. The hospital discharging the infant to home must screen the infant's hearing. Even if the infant was screened and passed at a previous facility, the discharging hospital should perform a hearing screening, as the infant's health status may have changed.

A variety of technologies are currently available to identify hearing loss in the first days of life. The two current methodologies generally accepted as effective for universal newborn hearing screening are:

- **Auditory brainstem response (ABR)**
- **Evoked otoacoustic emissions (EOAE).**

These techniques are physiological measures of the status of the peripheral auditory system that are highly correlated with hearing status. The techniques permit the identification of infants with communicatively significant hearing impairment without referring large numbers of normally hearing infants for unnecessary follow-up testing.

Due to the increased incidence of auditory neuropathy in the **NICU** patient population, the Advisory Committee recommends screening this population with **ABR.** For those infants with

prolonged hospital stays, hearing screening should be performed when the infant is clinically stable.

If the infant is receiving antibiotic therapy, hearing screening should still be performed prior to discharge. It is acceptable to screen the infant while still receiving antibiotics. Hospital discharge should not be delayed pending hearing screening off of antibiotic therapy. Likewise, antibiotic therapy should not be a reason for a "missed" screen.

Newborn hearing screening should result in a referral rate of less than 4% for infants in the regular nursery and a referral rate of no greater than 10% for infants in neonatal intensive care services. VDH will regularly monitor the false-positive rates and the referral rates at individual hospitals and will assist hospitals to achieve the recommended rates.

VDH recognizes that the majority of newborn hearing screenings will be performed by a variety of personnel including medical and non-medical personnel. Studies have documented that the actual screening can be carried out effectively by a wide variety of personnel with appropriate training. Recognizing the diversity in personnel, the Advisory Committee recommends the use of automated instrumentation that provides a pass / refer test outcome as the initial hearing screening device for hospitals.

When non-automated screening devices are utilized, the following protocols are recommended:
Auditory Brainstem Response (ABR)
Stimulus – air conduction click stimulus for both ears
Pass Criteria – replicable wave V response thresholds less than or equal to 25-20dBHL

(Click) Transient evoked Otoacoustic emissions (TEOAE)
Stimulus – air conduction click
Intensity – 80 $\pm$ 3 dB SPL
Pass Criteria

- Frequencies 2000 Hz through 5000Hz
- Three of four frequencies having reproducibility minimally: 70% @ 2400, 3200, 4000 and 5000 Hz

Distortion Product Otoacoustic Emissions (DPOAE)
Stimulus – pure tone complex
Intensity – maximum levels <70 dB SPL
Pass Criteria

- F2 = 2000, 3000, 4000 and 5000 Hz
- Three of four frequencies have a distortion product (2F1-F2) amplitude $\geq$6dB than measured noise floor levels

Hearing screening equipment should be calibrated annually and documentation maintained at the hospital. Statement of calibration shall be included in the facility's annual report to VDH.

Each hospital shall designate a person to be responsible for the newborn hearing screening program in that facility. This person will act as the single point of contact between the facility and the VDH VEHDI Program.
It is the responsibility of the facility to ensure that all screening personnel are appropriately trained to carry out the newborn hearing screening using appropriate technology. Training and quality assurance measures are vital components for the efficiency and overall effectiveness of screening programs.

A licensed audiologist with appropriate training and experience shall advise the hospital about all aspects of the newborn hearing screening program, including screening, tracking, follow-up and referral. For hospitals that do not have access to audiological personnel, VDH can provide the names of audiologists with experience in newborn hearing screening.

II. Data Collection Requirements: Identifying Risk Indicators

The *Code of Virginia* requires that hospitals determine the risk status for hearing loss on every newborn. The Virginia EHDI Program uses the risk indicators identified by the Joint Committee on Infant Hearing in the Year 2000 Position Statement. Because all newborns are physiologically screened for hearing loss, risk status for progressive, delayed-onset, and/or conductive hearing loss shall be identified.

Risk Indicators for Progressive or Delayed-Onset Sensorineural and/or Conductive Hearing Loss (For Use with Neonates and Infants through Two Years of Age)

- **Family history** of permanent childhood hearing loss. This information should be obtained by direct query to parent(s). Response should be clarified with the following:
    - Family member born with a hearing loss or hearing loss identified in childhood
    - Family members include siblings, parents, grandparents, aunts, uncles and cousins of the child.
    - Hearing loss not caused by that family member's medical conditions (such as prematurity or ear infections); not associated with old age; not job related (such as hearing loss from working in a noisy environment); or, not the result of sudden noise or an accident.
- **Stigmata or other findings associated with a syndrome** known to include a sensorineural or conductive hearing loss or Eustachian tube dysfunction. This includes the presence of a preauricular ear tag or pit/sinus. Syndromes associated with hearing loss include (but are not limited to)
    - Branchio-oto-renal (BOR)
    - CHARGE association
    - Choanal atresia
    - Goldenhar (oculo-auriculo-vertebral or OAV)
    - Pendred
    - Pierre Robin
    - Rubenstein-Taybi
    - Stickler
    - Trisomy 21 (Down)
    - Waardenburg

- **Postnatal infections** associated with sensorineural hearing loss including bacterial meningitis.
- **In utero infections** such as cytomegalovirus, herpes, rubella, syphilis, and toxoplasmosis. In utero infections are pertinent only to this pregnancy and/or this infant.
  - Herpes is **YES** if
    - Diagnosis of neonatal herpes or
    - Active lesion at the time of birth, vaginal delivery or
    - Active lesion, Cesarean delivery, with premature rupture of membranes
  - Herpes is **NO** if
    - Active lesion, but Cesarean delivery with no premature rupture of membranes or
    - No active lesion at birth
- **Neonatal indicators**
    - hyperbilirubinemia at a serum level requiring exchange transfusion
    - persistent pulmonary hypertension of the newborn associated with mechanical ventilation
    - conditions requiring the use of extracorporeal membrane oxygenation (ECMO).
- **Syndromes associated with progressive hearing loss** such as neurofibromatosis, osteopetrosis, and Usher's syndrome.
- **Neurodegenerative disorders**, such as Hunter syndrome, or sensory motor neuropathies, such as Friedreich's ataxia and Charcot-Marie-Tooth syndrome.
- **Head trauma**. Refers to head injury, such as a skull fracture. The use of vacuum suction during birth with no associated trauma or injury to the head does not constitute "head trauma".
- **Parental or caregiver concern** regarding hearing, speech, language, and or developmental delay.
- **Recurrent or persistent otitis media with effusion** for at least 3 months.

VDH recommends that a medical professional obtain the risk information from the infant's and mother's charts; family history should be a direct question to the parent(s). The parent should not be given the whole list of indicators to check off; they may not know about or understand the meaning of all indicators.

Some of these indicators are not present and/or would not be identified in the newborn period. These include parental concern, some neurodegenerative disorders or sensory motor neuropathies, and recurrent or persistent otitis media. These are included in the risk indicator list because parents and physicians should be informed about all indicators that can contribute to development of hearing loss beyond the newborn period.

Reporting accuracy is **crucial** to families and to the program. A risk indicator identified incorrectly will cause unnecessary worry for parents as well as unnecessary time and expense spent in obtaining follow-up testing.

Important Note: Hospitals should develop methods for collection and recording of all required data that assure data quality. In hospitals where the staff who perform the screening and staff who record risk indicators are different from staff entering the data, recording of the data as well as adherence to reporting requirements should meet strict quality control standards. Information

regarding screening status/results and risk indicators should be a permanent part of the patient's medical record.

III. Notification Requirements: Informing Families and Primary Medical Care Providers

Hospitals are required by regulation to:

- Provide written information to the parent that includes purposes and benefits of newborn hearing screening, the procedures used for screening, recommendations for further testing, where testing can be obtained, and indicators of hearing loss,
- Inform the parent of the results of their child's newborn hearing screening, in writing and prior to discharge, and
- Provide written screening results and recommendations to the primary medical care provider (PCP) to whom the infant will go for care after discharge.

The VDH brochure, Virginia's Newborn Hearing Screening Program, was developed to inform parents about the concept of newborn hearing screening and follow-up. It is important that hospitals give this brochure to the parent. Brochures are available from VDH, free of charge, in English and Spanish. To **order a supply**, please contact MSS (Marketing Support Solutions) at 434-385-1900 x 226 (phone) or 434-385-4996 (fax). **MSS is the only source for these brochures.** Translations of the brochure's text are available in Farsi, Korean, Mandarin Chinese, Urdu, and Vietnamese. Contact the EHDI Program at 804-864-7713 to obtain these additional translations.

A list of VDH approved Diagnostic Audiology Providers can be accessed and printed from the VISITS system, under Referral Centers on the menu.

Information is available at www.vehdis.info on communicating screening outcomes to families. A Power Point presentation with notes for use in training hospital staff also is available on that Web site.

Specific follow-up recommendations:

- Tell families that they can contact the Virginia EHDI Program at any time for referral assistance to a physician or audiologist at 804-864-7718 or Toll Free 1-866-493-1090.
- The importance of the follow-up, the importance of contacting their child's primary medical care provider with any developmental concerns, and the benefits of the early identification of hearing loss should be communicated to all parents.
- An infant who **does not pass (refer)** initial hearing screening shall be referred for a diagnostic audiological evaluation at a center approved by VDH. Prior to discharge the hospital shall give written information to the parent as to where this evaluation can be obtained. This evaluation should occur within one month of hospital discharge
- Infants with **incomplete** hearing screening results (due to uncooperative infant, debris in ear canal or excess myogenic activity) shall be considered as a **refer**.
- For infants who are missed, the hospital shall inform the parent, prior to discharge, of the need for the hearing screening and shall provide a mechanism by which that screening can occur at no additional cost to the family. This screening should occur within one month of hospital discharge.
- Infants who pass but have an identified risk indicator for progressive or delayed-onset hearing loss (pass with follow-up) should be retested at six months of age and be monitored every six months until the age of 3.

IV. Reporting Requirements

Results of newborn hearing screening shall be reported to VDH using the Virginia Infant Screening and Infant Tracking System (VISITS) database.

- In order for the system to function optimally, it is recommended that you use Internet Explorer 6.0 or higher when using the VISITS database.
- Users are now REQUIRED to verify that their browser is capable of 128-bit encryption.
- User support is available (8:15 am-5 pm) by calling VDH at 804-864-7717.

A. Hospitals are required to report the following infants to VDH, via the database, within one week of discharge:

- Infants who fail the screening (refer)
- Infants who are missed (not screened prior to discharge)
- Infants who pass but have a risk indicator for progressive or delayed-onset hearing loss (pass with follow-up)
- Infants whose parent refused the hearing screening
- Infants who are transferred out of state. In these cases, enter all the information on the infant including the name of the hospital or facility receiving the transfer.

B. Hospitals are not required to report infants who pass the newborn hearing screening prior to discharge and who have no risk indicators.

C. Hospitals should not report infants who are transferred to another hospital within Virginia.

D. Hospitals are required to identify and report infants at risk for progressive or delayed-onset hearing loss, regardless of the results of the hearing screening.

- The database requires the user to record the specifics for all indicators. For example, for "in utero infections", enter one of the five listed. *This specific information is vital to linking the incidence of hearing loss in children to specific risk indicators.*

E. Hospitals are required to report the information included in the hospital monthly totals via the database, no later than the fifteenth of the following month.

- Total discharged to home in that month
- Of the total discharged in that month, the number of infants who passed the hearing screening and had no risk indicators.

Important Note: Hospitals should report the screening or rescreening that is performed at their facility only. Do not enter results from tests done by other facilities.

F. Hospitals that bring infants back for the initial screen (if missed) or for a rescreen (did not pass/refer) should report the results to VDH via the VISITS database. It is important that the infant is entered initially in VISITS as "missed" or "referred"; then, following the outpatient screen, those results should be entered as a post-discharge screening.

G. On January 1st of each year, hospitals are required to report the following information to VDH (template available on VISITS main page):

- Test procedures used by the facility's newborn hearing screening program
- Name, telephone number and e-mail address of program director
- Name of advising audiologist
- Screening equipment utilized, including date/record of calibration, screening protocols, and referral criteria.

The *Code of Virginia* reference for the Virginia Early Hearing Detection and Intervention Program is Section 32.1-64.1. The regulations governing the program are 12 VAC 5-80.

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